CLAIMS

What is claimed is:

1. A method, comprising:

defining a void in a sacrificial layer proximate to an active layer;

forming an overgrowth layer in the void and over portions of the sacrificial layer adjacent to the void;

defining a ridge section in the overgrowth layer; and

removing portions of the sacrificial layer to define a shank section in the overgrowth layer under the ridge section, the ridge section having a greater lateral dimension than the shank section to reduce electrical resistance between the active layer and electrical interconnects to be electrically coupled to the ridge section.

2. The method of claim 1 wherein defining the void in the sacrificial layer comprises etching the sacrificial layer with a first etching substance reactive with the sacrificial layer.

3. The method of claim 2, further comprising forming an etch stop layer between the active layer and the sacrificial layer, the etch stop layer being non-reactive with the first etching substance.

4. The method of claim 3 wherein defining the ridge section in the overgrowth layer comprises etching the overgrowth layer with a second etching substance reactive with the overgrowth layer and non-reactive with the sacrificial layer.

5. The method of claim 4 wherein removing portions of the sacrificial layer to define the shank section in the overgrowth layer comprises etching away the portions of the sacrificial layer with the first etching substance.

6. The method of claim 1, further comprising forming a planarization layer around the shank section and the ridge section of the overgrowth layer, the planarization layer comprising a polymer.

7. The method of claim 6, further comprising forming a conductive contact on top of the ridge section, the conductive contact to couple the electrical interconnects to the ridge section.

8. The method of claim 4 wherein the overgrowth layer comprises a P-type semiconductor material and the active layer comprises an intrinsic semiconductor material.

9. The method of claim 8 wherein the P-type semiconductor material comprises one of InP and AlGaAs, and wherein the intrinsic semiconductor comprises one of InGaAsP, InGaAs, and GaAs.

10. The method of claim 9 wherein the first etching substance comprises a mixture of at least two of H_2SO_4, H_2O_2, and H_2O, and wherein the second etching substance comprises a mixture of hydrochloric acid (HCl) and phosphoric acid (H_3PO_4).

11. The method of claim 1 wherein the ridge and shank sections of the overgrowth layer form a substantially T-shaped ridge structure.

12. An apparatus, comprising:

a semiconductor active layer formed proximate to a substrate layer;

a shank section of a semiconductor structure adjoining the semiconductor active layer; and

a ridge section of the semiconductor structure adjoining the shank section, the ridge section having a larger lateral dimension than the shank section, the ridge section to be electrically coupled to an electrical interconnect such that the electrical interconnect is to be electrically coupled to the semiconductor active layer through the ridge and shank sections.

13. The apparatus of claim 12, further comprising a conductive contact electrically coupled to a top surface of the ridge section to provide a low resistance connection thereto, the electrical interconnect coupled to the conductive contact.

14. The apparatus of claim 12, further comprising a planarization layer surrounding the ridge and shank sections.

15. The apparatus of claim 14 wherein the planarization layer comprises an electrically insulating polymer having a low dielectric constant.

16. The apparatus of claim 14 wherein the planarization layer comprises a semiconductor oxide.

17. The apparatus of claim 12, further comprising an etch stop layer between the semiconductor active layer and the shank section, the etch stop layer to conduct current from the ridge and shank sections into the semiconductor active layer, the etch stop layer being non-reactive with an etching substance used to etch a sacrificial layer.

18. The apparatus of claim 17 wherein the etch stop layer comprises the same material as the ridge and shank sections.

19. The apparatus of claim 12 wherein the ridge and shank sections comprise a P-doped semiconductor material, the semiconductor active layer comprises an intrinsic semiconductor material, and the substrate layer comprises an N-doped semiconductor material.

20. The apparatus of claim 19 wherein the shank section, the semiconductor active layer, and the substrate layer form a P-I-N photodiode.

21. The apparatus of claim 19 wherein the shank section, the semiconductor active layer, and the substrate layer form a semiconductor laser structure.

22. The apparatus of claim 12 wherein the ridge and shank sections comprise a P-doped semiconductor material and the semiconductor active layer comprises an N-doped semiconductor material, the shank section and the semiconductor active layer forming a P-N diode junction.

23. The apparatus of claim 22 wherein the shank section, the semiconductor active layer, and the substrate layer form a P-N-P bipolar junction transistor ("BJT").

24. The apparatus of claim 12 wherein the ridge and shanks sections comprise one of InP and AlGaAs.

25. The apparatus of claim 12 wherein the semiconductor active layer comprises one of InGaAsP, InGaAs, and AlGaAs.

26. The apparatus of claim 12 wherein the semiconductor active layer comprises a waveguide.

27. The apparatus of claim 12 wherein the ridge and shank sections form a substantially T-shaped ridge structure.

28. A system, comprising:

a transmitter to generate an optical signal, the transmitter including a laser diode, the laser diode, comprising:

a first semiconductor active layer to generate the optical signal;

a first shank section of a first semiconductor structure adjoining the first semiconductor active layer; and

a first ridge section of the first semiconductor structure adjoining the first shank section, the first ridge section having a larger lateral dimension than the first shank section, the first ridge section electrically coupled to a first electrical interconnect to provide current to the first semiconductor active layer; and

a communication channel optically coupled to the transmitter to receive the optical beam and to guide the optical beam; and

a receiver optically coupled to the communication channel to receive the optical signal therefrom.

29. The system of claim 28 wherein the communication channel comprises an optical waveguide.

30. The system of claim 28 wherein the receiver includes a photo detector to receive the optical signal and to convert the optical signal to an electrical signal, the photo detector comprising:

a second semiconductor active layer to receive the optical signal;

a second shank section of a second semiconductor structure adjoining the second semiconductor active layer; and

a second ridge section of the second semiconductor structure adjoining the second shank section, the second ridge section having a larger lateral dimension than the second shank section, the second ridge section to couple to a second electrical interconnect to pass second current generated by the second active layer to the electrical interconnect, the second current generated by the second active layer in response to the optical signal.